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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/600,654

06/23/2003

Byung-Cheol Song

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EXAMINER

HUNG, YUBIN

ART UNIT

PAPER NUMBER

2624

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

01/12/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/600,654	SONG ET AL.	
	Examiner	Art Unit	
	Yubin Hung	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-58 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-38 and 58 is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6,7,10-21,23,25,26,39,40,42,44,45 and 48-57 is/are rejected.
- 7) ☒ Claim(s) 3,5,8,9,22,24,27,28,41,43,46,47 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06/23/03 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/23/03, 11/17/03</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings are objected to because in Figs. 3 and 5 the arrow should point from the decoder to the decoder complexity calculator (see P. 6, paragraph 33).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities:

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- P. 7, lines 2-3: consider rewriting to read "If ~~a ratio of~~ the amount of processing of an IDCT computation ~~to the amount of the decoding computation~~ on the previous frame" (per line 3 of paragraph 34)

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 10-19 and 48-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claims 10 and 48 recite the limitation "the skipping of DCT" in line 7 and line 8, respectively. There is insufficient antecedent basis for this limitation in the claim. Dependent claims 11-19 and 49-56 inherit the same problem and are similarly rejected. [Note: for examination purpose, "the skipping of DCT" will be interpreted as "a skipping of DCT."]

6. Claim 18 recites the limitation "the threshold" in line 1. There is insufficient antecedent basis for this limitation in the claim. [Note: for examination purpose, "the

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threshold" will be interpreted as "a threshold." Note further that it appears that claim 18 should have depended from claim 13, where a threshold is first recited, instead.]

7. Claim 19 recites the limitation "the calculated threshold" in line 2. There is insufficient antecedent basis for this limitation in the claim. [Note: for examination purpose, "the calculated threshold" will be interpreted as "a calculated threshold." Note further that it appears that claim 19 should have depended from claim 13, where a threshold is first calculated, instead.]

8. Claim 56 recites the limitation "the threshold" in line 1. There is insufficient antecedent basis for this limitation in the claim. [Note: for examination purpose, "the threshold" will be interpreted as "a threshold." Note further that it appears that claim 56 should have depended from claim 51, where a threshold is first recited, instead.]

9. Claim 57 recites the limitation "the calculated threshold" in line 2. There is insufficient antecedent basis for this limitation in the claim. [Note: for examination purpose, "the calculated threshold" will be interpreted as "a calculated threshold." Note further that it appears that claim 57 should have depended from claim 51, where a threshold is first calculated, instead.]

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10. [Examiner's Comment: It also appears that claims 15 and 24 should be more logically dependent from claims 14 and 24, respectively. See, for claim 24, its parallel method and medium claims 5 and 43 and for claim 15, its parallel apparatus and medium claims 34 and 53. Also note that the term "further" is used in both claims.]

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1, 2, 4, 6, 7, 20, 21, 23, 25, 26, 39, 40, 42, 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over APA (Admitted Prior Art of Fig. 2 and paragraphs 12 & 13 on page 2 of the instance application), and further in view of Boyce et al. (US 5,825,927) and Tan et al. (US 6,542,549).

13. Regarding claim 1, and similarly claim 39, APA discloses a method for controlling the DCT computation amount that

- receiving *complexity information* on previous image data [Fig. 2, refs. 220, 270 & 280 (receiving complexity information from 220 & 270); P. 2, paragraph 13, lines 1-4. Note that the outputs from 220 and 270 constitute complexity information]
- controlling a skipping of DCT operations on current image data based on the received *complexity information* [Fig. 2, refs. 210 & 280; P. 2, paragraph 13]

APA does not expressly disclose that the complexity information is decoder complexity information that represents an amount of decoding computation performed on previous image data.

However, Boyce discloses using information feedback from a decoder as a control signal for the compression circuit [Fig. 7, refs. 701 (decoder) & 712 (compression circuit); Col. 6, lines 27-29 & 39-46. Note that skipping DCT computation as disclosed in APA is a form of compression control.]

In addition, Tan discloses using the amount of decoding computation performed on previous image data as feedback information. [For the feeding-back, see Fig. 12, refs. 301 & 302 (feeding back complexity information from VCV 302 to encoder 301), as well as Fig. 18, refs. 601 (Macroblock Type Decision), 611 & 612 (showing VCV 612 feeding back complexity information that controls Macroblock Type Decision at 601) and Col. 11, lines 8-13. Note that Col. 9, lines 9-42, especially 18-20, 26-27 and 38-42, describe how VCV determines the amount of decoding computation complexity (as performed on previous image data, see lines 28-34). Note further that Fig. 8, ref. 804 (Virtual Decoder Model) shows that the VCV models the decoder (see also Col. 9, lines 15-17). Note further still that Fig. 2, ref. 201 (Macroblock Type Decision) and Col. 2, lines 1-4 describe how Macroblock Type Decision (also shown in Fig. 18 as ref. 601) controls macroblock encoding decisions, of which skipping the DCT operation, as disclosed in the APA, can certainly be one.]

APA, Boyce and Tan are combinable because they all have aspects that are from the same field of endeavor of encoding.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify APA with the teachings of Boyce and Tan by using the decoding computation complexity information fed back from the decoder to control the encoding process (such as skipping DCT computation). The motivation would have been to allow the decoder to deal with unpredictable worst-case encoded bitstream (as indicated by Boyce in Col. 6, lines 48-51), as well as to accurately constraint the resource requirement in the decoder (as Tan indicates in Col. 3, lines 30-34 & 40-52).

Therefore it would have been obvious to combine Boyce and Tan with APA to obtain the invention as specified in claim 1.

14. Regarding claim 20, note that APA further discloses a DCT computation amount controller [Fig. 2, ref. 280] which, as modified by the teachings of Boyce and Tan as set forth above will control skipping of DCT operations using decoder computational complexity [per the analysis of claim 1]; Fig. 2, ref. 210 and P. 2, paragraph 13 further discloses a DCT unit under the control of the controller. Therefore claim 20 is obvious and is accordingly rejected.

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15. Regarding claim 2, and similarly claims 21 and 40, Tan further discloses

- wherein the receiving decoder complexity information further comprises calculating the decoder complexity information which represents the amount of decoding computation performed on previous image data [Fig. 12, ref. 302 (feeding back complexity information to encoder 301) and Col. 9, lines 9-42, especially 18-20, 26-27 and 38-42, which describe how VCV calculates the amount of decoding computation complexity, as performed on previous image data (see lines 28-34). Note further that Fig. 8, ref. 804 (Virtual Decoder Model) shows that the VCV models the decoder; see also Fig. 12, ref. 305 and Col. 9, lines 15-17.]

16. Regarding claim 4, and similarly claims 23 and 42, Tan further discloses

- wherein the decoder complexity information includes information on a decoder computation amount allowed for the previous image data [Col. 11, lines 9-12. Note that the defined bound against the complexity is checked is considered the allowed decoder computation complexity]
- information on a decoder computation amount actually consumed for the previous image data [Per the analysis of claim 1. Note that as set forth in that analysis, the combined invention of APA, Boyce and Tan discloses a method in which the actual decoder information for the previous image data is provided to the encoder (as taught by Boyce in Fig. 7, refs. 701 & 712 and Col. 6, lines 27-29 & 39-46) and, as taught by Tan (Col. 9, lines 9-42, especially 18-20, 26-27 and 38-42), the feedback information is the decoder complexity representing computation amount]

17. Regarding claim 6, and similarly claims 25 and 44, Tan further discloses

- wherein the previous image data are a predetermined number of previous frames, and the current image data is a frame being currently encoded [Col. 9, lines 28-34 (i.e., the number of previous pictures to be decoded, or the size of the previous image data, is one); Col. 11, lines 9-12 (since the decision is made on a per-macroblock basis, the current image data is the frame that contains the macroblock being encoded (therefore the frame per se is being encoded))]

18. Regarding claim 7, and similarly claims 26 and 45, APA further discloses

- wherein a DCT operation on the current image data is executed or skipped in the currently-encoded frame on a block-by-block basis [Fig. 2, ref. 210; P. 2, paragraph 13, lines 3-4]

Allowable Subject Matter

19. Claims 29-38 and 58 are allowed.

20. Claims 3, 5, 8, 9, 22, 24, 27, 28, 41, 43, 46 and 47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

21. Claims 10 and 48 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

Dependent claims 11-17 and 49-55 will also become allowable as a result.

22. Should claims 10 and 48 be rewritten or amended as set forth in the paragraph above (and therefore become allowable), then dependent claims 18, 19, 56 and 57 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

23. The following is a statement of reasons for the indication of allowable subject matter:

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A. Regarding claim 3, and similarly claims 22 and 41, the combined invention of APA, Boyce and Tan discloses all limitations of its parent, claim 1. APA further discloses calculating a threshold value and using it to control the skipping of DCT operations [Fig. 2, ref. 280 and P. 2, paragraph 13, lines 1-4]. Tan further discloses comparing the complexity with a defined bound (i.e., threshold) to make encoding decision [Col. 11, lines 9-13]. Lin et al. (US 6,748,019) also discloses using a threshold to determine whether DCT operations should be skipped [Fig. 3; Col. 2, lines 30-34]. However, none of the recited references, alone or in combination, disclose, teach or suggest calculating a target DCT computation amount for the current image data using the received decoder complexity information and using it to calculate the threshold for DCT skipping decision.

B. Regarding claim 5, and similarly claims 24 and 43, closest art of record APA, Boyce, Tan and Lin, alone or in combination, do not disclose, teach or suggest including the ratio recited in the claim as part of the decoder complexity information.

C. Regarding claim 10, and similarly claims 29, 48 and 58, per the analysis of claim 1, the combined invention of APA, Boyce and Tan discloses the limitations regarding the receiving of decoder complexity information for DCT skipping control. APA further discloses the use of SAD (which is not a variation of the motion estimator (ME) computation amount) in the DCT skipping control [Fig. 2, refs. 270 & 280; P. 2, paragraph 13].

In addition, Gonzales et al. (US 5,231,484) discloses using the outputs from the ME for rate control [Fig. 11, refs. 14 & 15; Col. 15, line 39-Col. 20, line 36]; Elbaz et al. (US 6,757,005) discloses using the motion vectors and their associate quality factor to decide whether the encoding of a macroblock should be skipped [Fig. 4, refs. 180, 410, 420, 450 & 460; Col. 8, lines 13-41]; and Kim et al. (US 2002/0118746) discloses using sum of absolute difference (SAD) from the ME for rate control [P. 2, equation 1 and paragraphs 21, 22 & 25].

However, none of the references cited above, alone or in combination, disclose, teach or suggest using ME computation amount variation information in determining whether to skip DCT operations on current image data.

Conclusion and Contact Information

24. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure

- Greenbaum et al. (US 2005/0123058) – discloses decoding encoded frame for rate control [Fig. 5]
- Ribas-Corbera et al. (US 6,385,345) – discloses skipping encoding based on block energy [Figs. 4 & 5]

- Rajugopal et al. ("Adaptive rate controlled, robust video communication over packet wireless networks," Mobile networks and Applications 3 (1998), pp. 33-47) – discloses using channel feedback for rate control [Fig. 2]
- Conklin et al. ("Video coding for streaming media delivery on the Internet," IEEE T. Circuits and Systems for Video Technology, V. 11, No. 3, March 2001, pp. 269-281) – discloses uses output from motion estimator for rate control [Fig. 5]

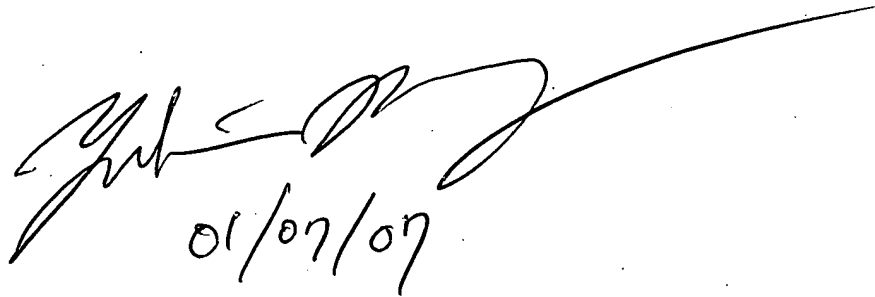
25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yubin Hung whose telephone number is (571) 272-7451. The examiner can normally be reached on 7:30 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Yubin Hung
Patent Examiner
Art Unit 2624
January 07, 2007



01/07/07